

PATENT SPECIFICATION

DRAWINGS ATTACHED

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L.103,189

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Date of filing Complete Specification: Feb. 1, 1967.

Application Date: Nov. 1, 1965.

No. 46121/65.

Complete Specification Published: Feb. 14, 1968.

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Index at acceptance: —B5 D(10B2D, 10F1); B8 P8C1B4

Int. Cl.: —B 31 b 3/26

COMPLETE SPECIFICATION

Improvements relating to the Erection of Cardboard Boxes

We, BELL ENGINEERING (SLOUGH) LIMITED of London Road, Burnham, Buckinghamshire, a British Company declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the erection of boxes made of cardboard or stiff paper and hereinafter referred to for convenience as cartons.

A current trend in the packaging industry, at least for certain classes of commodity, is the abandonment of cartons with lids and the use instead of open carrtons which after erection and filling are shrink wrapped with transparent polythene or like plastic sheeting so that the goods remain visible through the top of the package. In general the shrink wrapping process involves the use of cartons having radiused as opposed to sharp, corners and the rapid erection of cartons of this special type is the problem towards which the present invention is directed.

In accordance with the present invention a method of erecting a flat carton blank of a kind having tabs adapted when erected to form radiused corners of the carton comprises firstly erecting the sides of the carton by carrying the blank by a ram into a forming chamber having contoured entry portions which guide the ends of the tabs into slots in opposite sides of the carton as the slots are opened by members inside the forming chamber, and then finally locking the ends of the tabs in the slots after withdrawal of the ram by engagement of inwardly turning retractable fingers mounted on opposite sides of the forming chamber.

A particular and at present preferred machine in accordance with the invention will now be described with reference to

the accompanying drawings, in which:—

Figure 1 is a plan view of a flat carton blank on which the machine is intended to operate;

Figure 2 is a plan view of the same carton after it has been erected by the machine;

Figure 3 is a top fragmentary view of the machine showing the component parts and a flat carton in a preparatory position;

Figure 4 is a plan view of the ram;

Figure 5 is a plan view of the forming chamber;

Figure 6 is a section on line VI—VI of Figure 5; and

Figure 7 is a side elevation from within the forming chamber in a vertical plane perpendicular to line VI—VI of Figure 5.

Referring firstly to Figure 1, there is shown a carton blank comprised of a central panel 1 which will constitute the base of the carton when erected, a pair of side panels 2 each with a pair of corner-forming tabs 3, and a pair of end panels 5. Each of the tabs 3 terminates in an ear having a rectangular entry part 5 and a locking part 6. Each of the end panels 4 has a pair of opposite facing obtuse-angled slits 7 respectively adjacent its side edges. The machine is designed to erect the side panels 2 and end panels 4, to bend the tabs 3 above and around the corners of the central panel 1, to insert the parts 5 and 6 through the slits 7 to which they are then adjacent, to lock the parts 6 relative to the slits and then discharge the thus erected and locked carton. The erected and locked carton is of tray-like form with rounded corners as shown in Figure 2. Figure 2 shows that in the erected carton there is a curved slot 8 formed between the lower edge of each tab 3 and the adjacent radiused part of the blank,

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these slots serving for instance to receive and locate the cornermost articles in the carton.

In Figure 3 there is shown a flat carton blank C, as already described, resting upon a platform 26 and located between parallel guides 10. Ahead of the guides is a rectangular forming chamber 11 conveniently made of wood. The mouth of the chamber has flared side surfaces 11A and contoured corner surfaces 11b for centralising the carton and respectively causing progressive erection of the carton side panels 2 and curving of the corner forming tabs 3. Each end of the chamber has a pair of parallel vertical metal ribs 12 situated adjacent the corners thereof. Towards the bottom the walls of the chamber are recessed to accommodate a series of panels 13 which are inwardly biased by coil springs (not shown). Each chamber side wall has two such panels and each chamber end wall has one such panel.

Each end wall of the chamber is further recessed adjacent each corner to accommodate a folding finger 14. These folding fingers are secured in pairs of rotary actuating shafts 15 and have inclined end surfaces 14a.

As shown most clearly in Figures 3 and 7 there is mounted behind each finger 14 a vertical lever 16 swingably suspended from a pivot 17 at its top end and having a ledge 18 at its bottom end. These levers 16 are inwardly biased by coil springs 19 and their ledges 18 are connected in pairs, each by a bridge piece 20 having a central ledge 21.

These levers 16 and the associated ledges are retractable to the chain dashed line positions indicated in Figure 7 as the result of pressure applied by the obtuse angled faces of the fingers 14 when the latter are rotated by the shafts 15 to the chain-dashed line positions.

Referring now to Figures 3 and 4 there is shown a ram 22, which is conveniently made of wood, adapted to carry the carton into the forming chamber 11 and which is mounted on the end of a reciprocating vertical rod 23. The periphery of the ram is recessed as necessary to enable it to travel past the pawls 13 in the walls of the forming chamber. Additionally each end of the ram is equipped with a pair of vertical metal ribs 24.

The ram is caused to reciprocate by any appropriate mechanism which is not shown as it does not form part of the invention but which is normally driven by an electric motor. The ram does not operate continuously but only upon operation of a micro-switch control lever 25 which projects above the top of one side of the forming chamber. Whenever this switch is actuated an operating cycle, involving a downward and an upward stroke of the ram, occurs. The move-

ment of the ram is synchronised with rotary motion of the shafts 15 in any suitable, and generally well known, manner by mechanism (not shown).

The operating sequence is as follows:—

Starting from the position shown in Figure 3, the operator slides the carton blank C forwards on a table 26 between the guides 10 until its leading edge strikes the lever 25 and actuates the microswitch. The microswitch may either start the electric motor or actuate a clutch to connect a driving shaft of the motor to a driven shaft. In any event the ram 22 is caused to descend into the forming chamber carrying the carton blank C with it.

As soon as the carton enters the forming chamber, the contoured corner surfaces 11A of the latter act on the tabs 3 and force them into a curve as the remainder of the mouth of the chamber functions to cause erection of the carton side panels 2 and end panels 4. As soon as the ram 22 has moved appreciably into the forming chamber the ribs 24 on the ram act on the end panels of the carton and interact with the ribs 12 of the forming chamber, to open up the carton slits 7. This is in order that the slits can receive the entry and locking parts 5, 6 respectively of the tabs which have by now been fully curved to form the carton corners.

The continuing descent of the ram forces the carton down past the panels 13 which momentarily yield and then spring outwards to prevent accidental withdrawal of the carton when the ram subsequently ascends.

When the carton is almost at the bottom of the forming chamber, and the ram has withdrawn a short distance upwards there is a co-ordinated simultaneous rotary movement of both the shafts 15 which causes the fingers 14 to turn from the chain dotted portion to the full line portion shown in Figure 7. In so doing their inclined end surfaces 14A sharply engage the top edges of the locking parts 6. This causes the locking parts 6 and the entry parts 5 fully to enter the slits and firmly to engage respectively above and below the slits 7 to hold the sides and ends of the carton securely together.

Since as a result of the inward turning movement of the fingers 14 the latter have moved out of contact with the levers 16 the latter are moved inwards by their springs 19 so that the ledges 18 effectively support the carton whilst the fingers operate.

The shafts 15 then counter rotate and withdraw the fingers 14 which in turn move the levers 16 and ledges 18 in outward directions, by cam action of the obtuse angled faces of the fingers.

The whole cycle is then repeated when the next carton is fed, as already explained.

If after withdrawal of the ledges 18 the previously formed carton has not dropped down to the ejected position shown in chain dotted lines in Figure 7, it is formed to that position by air pressure when the next carton is forced downwards by the descending ram. The cartons so formed are then ready for filling and shrink wrapping.

It is to be understood that within the scope of the invention as broadly defined in the appended claims, modifications in the method and machine as above specifically described could be made. For instance the machine could be adapted for continuous automatic operation contingent upon the continuous supply of carton blanks to it by means such as a mechanical conveyor.

WHAT WE CLAIM IS:—

1. A method of erecting a flat carton blank of a kind having tabs adapted when erected to form radiused corners of the carton comprising firstly erecting the sides of the carton by carrying the blank by a ram into a forming chamber having contoured entry portions which guide the ends of the tabs into slits in opposite sides of the carton as the slits are opened by members inside the forming chamber, and then finally locking the ends of the tabs in the slits after withdrawal of the ram by engagement of inwardly turning retractable fingers mounted on opposite sides of the forming chamber.
2. A machine for performing the method set forth in Claim 1 comprising a forming chamber adapted to receive a carton blank and having a mouth adapted to cause erection of the carton sides and curvature of corner tabs when the blank is carried into the chamber by a ram, interacting means on the ram and in the forming chamber for opening preformed slits in the carton to permit entry of the ends of said tabs into said slits in the carton, and fingers movably mounted in the walls of the chamber for causing said ends of said tabs lockingly to engage

with the carton sides adjacent said slits after withdrawal of the ram from that carton.

3. A machine as set forth in claim 2 and further comprising means for preventing upward withdrawal of the carton together with the ram and movable means for supporting the carton whilst the fingers are operating upon it.

4. A machine as set forth in claim 3 in which the upward withdrawal prevention means are pawls mounted in walls of the forming chamber.

5. A machine as set forth in claim 3 or 4 in which the carton supporting means are retractable by the fingers when the fingers are withdrawn from their operating position inside the chamber.

6. A machine as set forth in any of claims 2 to 5 in which the fingers each have an inclined surface engageable with the top edge of a locking part of a tab when the fingers move inwardly of the chamber.

7. A machine as set forth in any of claims 2 to 6 in which said interacting means comprise outwardly projecting ribs on the ram and ribs projecting inwardly of the chamber from the chamber walls.

8. A machine as set forth in any of claims 2 to 7 in which the movable carton supporting means comprise ledges associated with pivotally mounted levers, said levers being retracted against spring bias by cam action of the fingers.

9. A method of erecting a flat carton blank of the kind referred to substantially as hereinbefore described with reference to the accompanying drawings.

10. A machine for erecting a flat carton blank of the kind referred to and which is constructed and arranged to operate substantially as hereinbefore described and as illustrated in the accompanying drawings.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1968.
Published by the Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

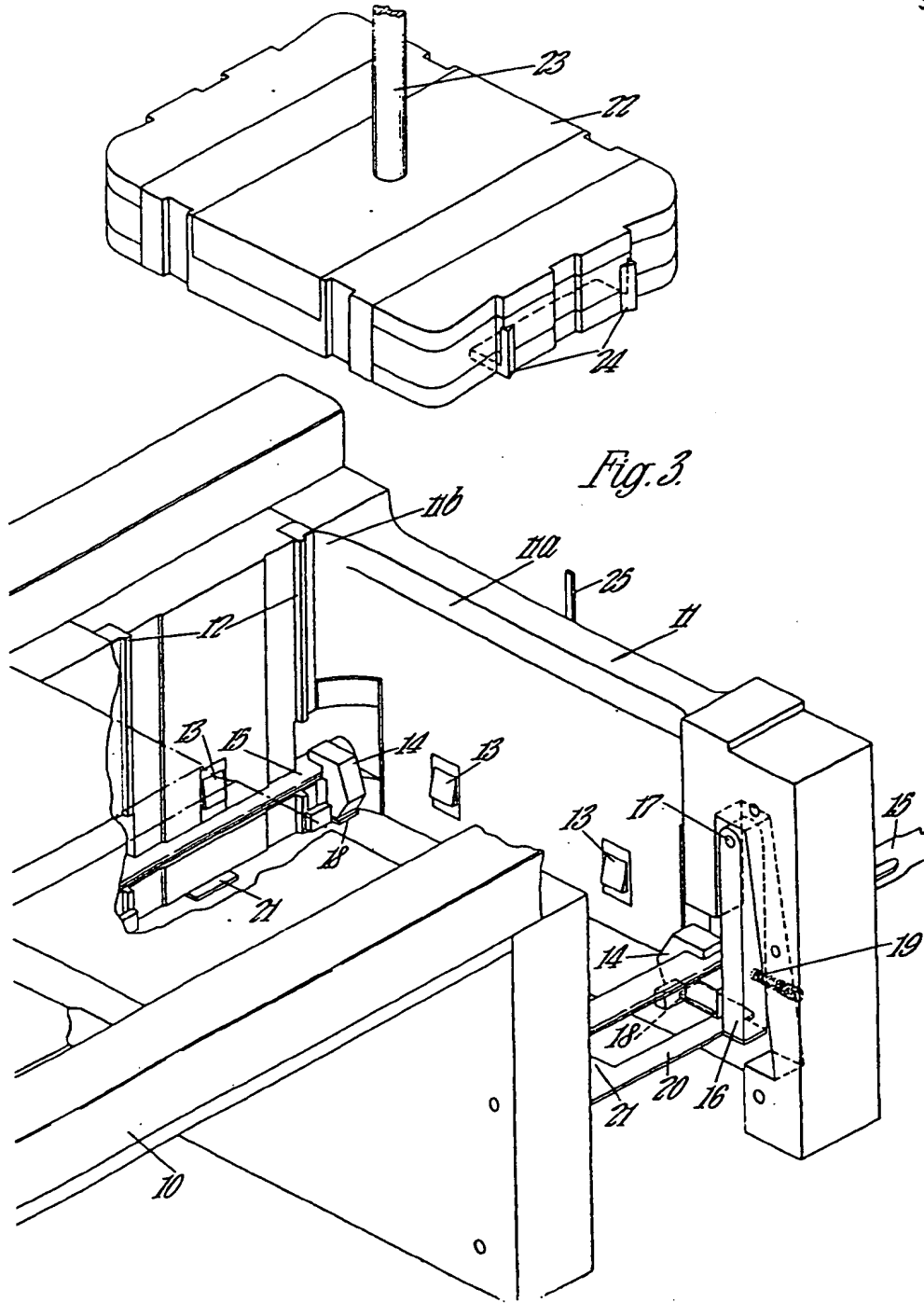
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3 SHEETS

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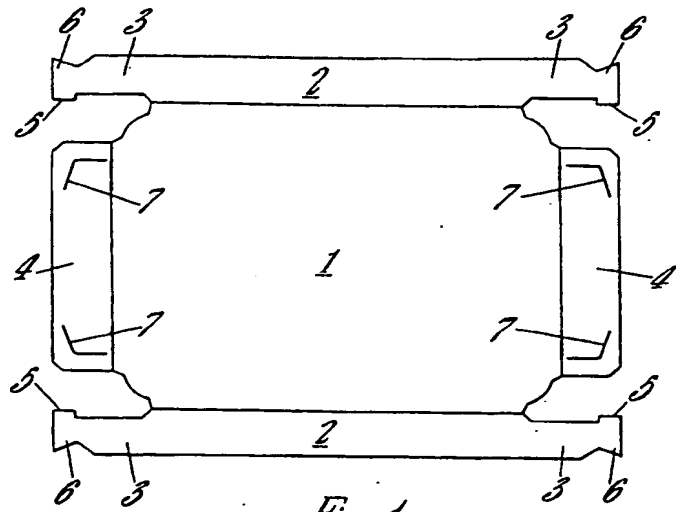
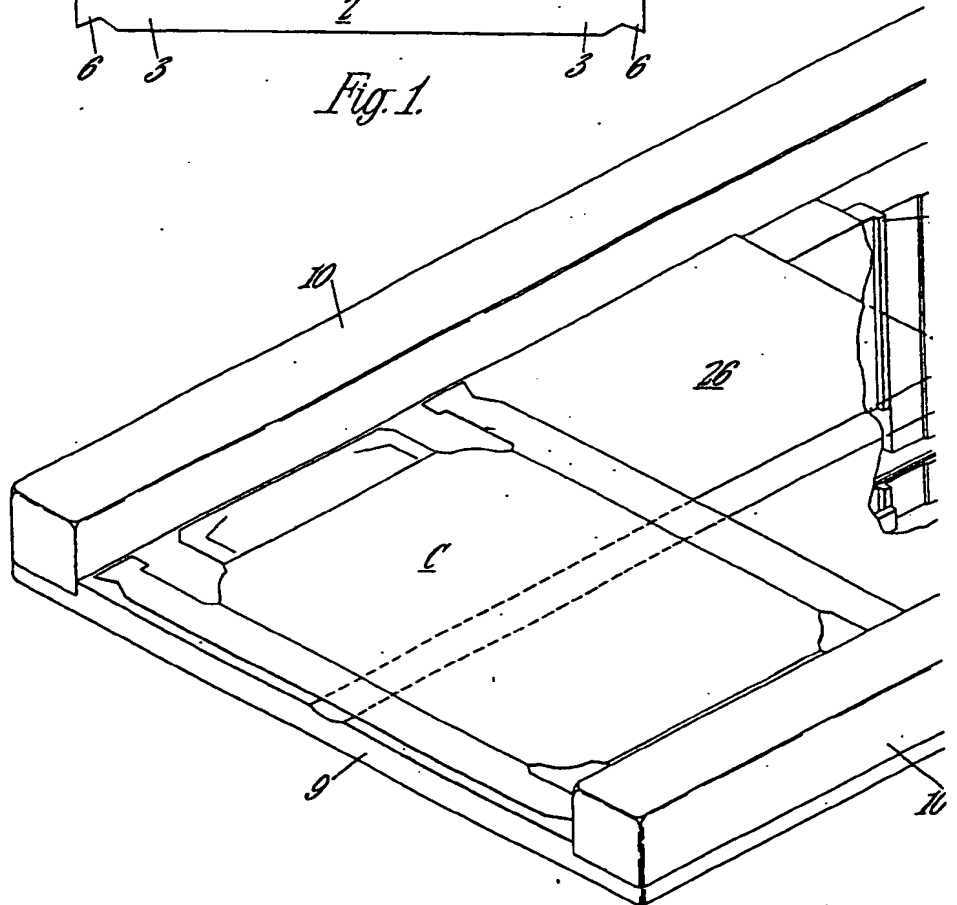
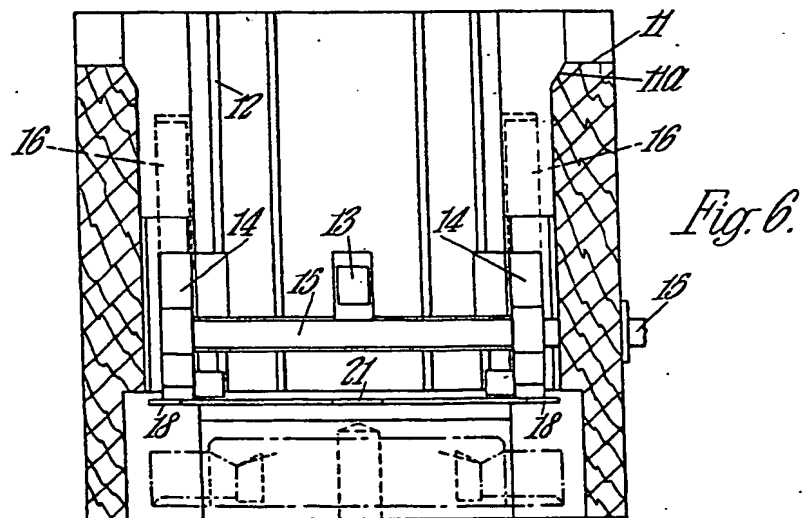
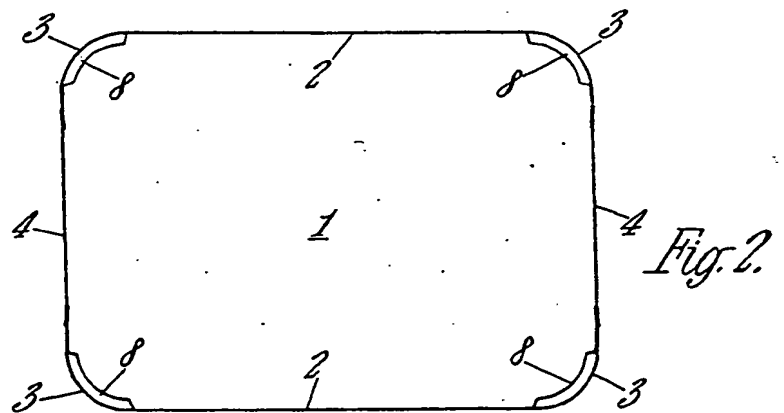
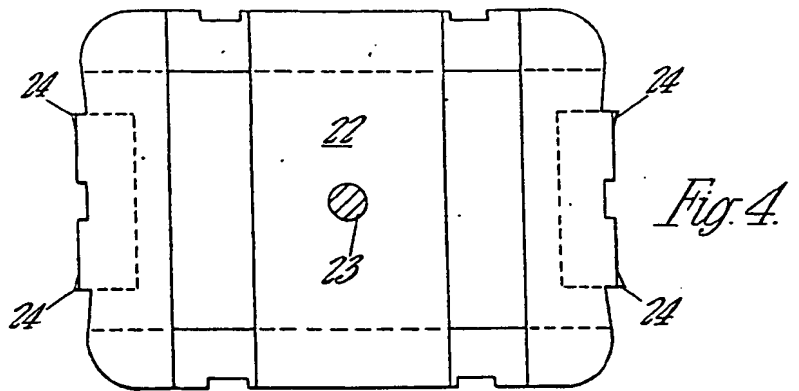


Fig. 1.





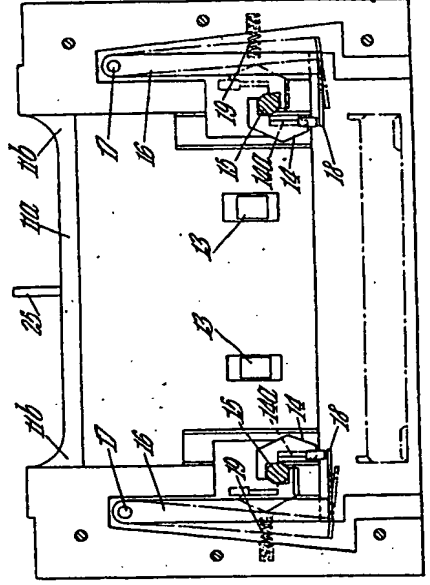
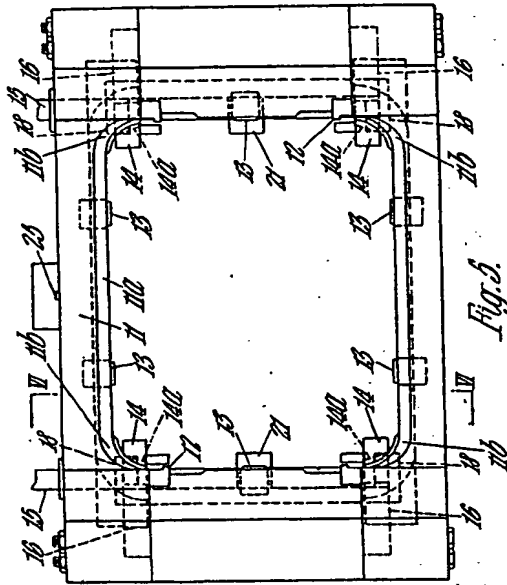
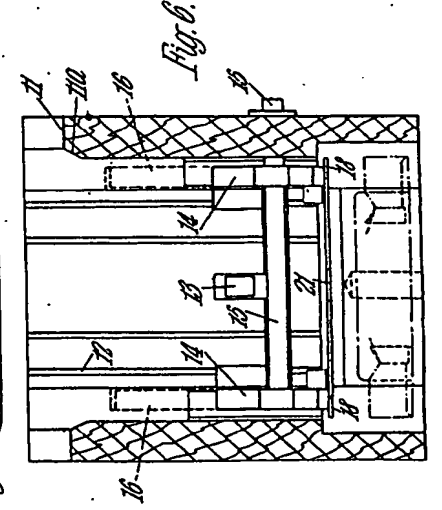
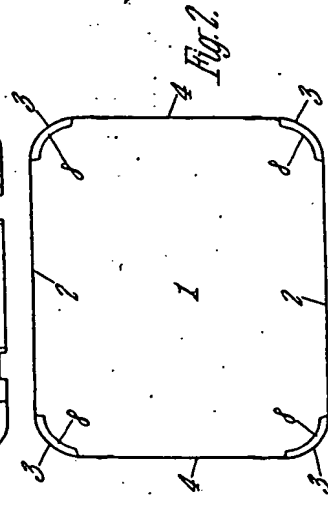
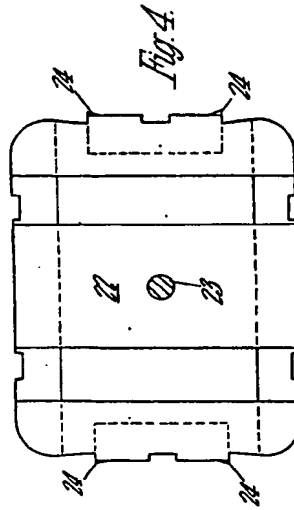


Fig. 7.

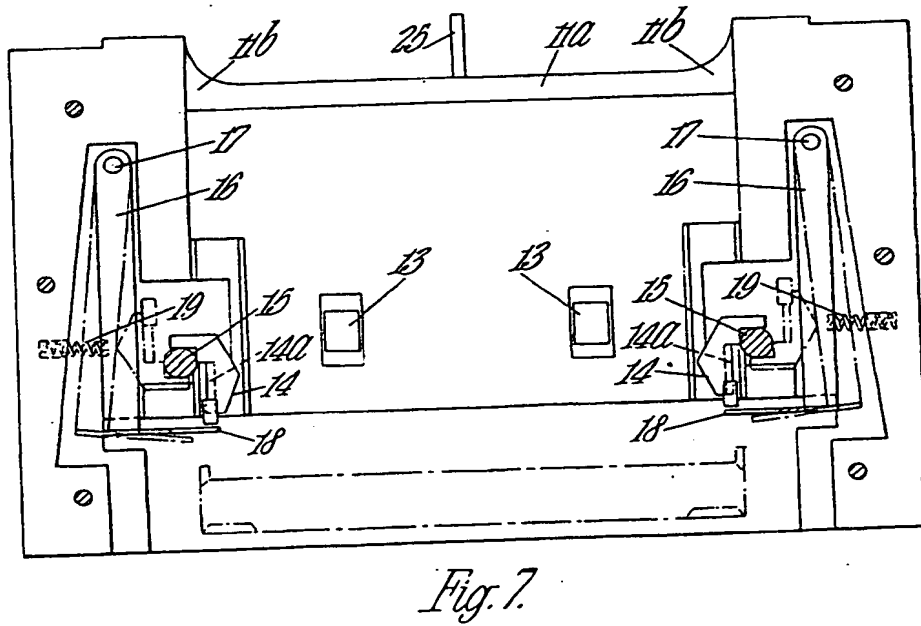
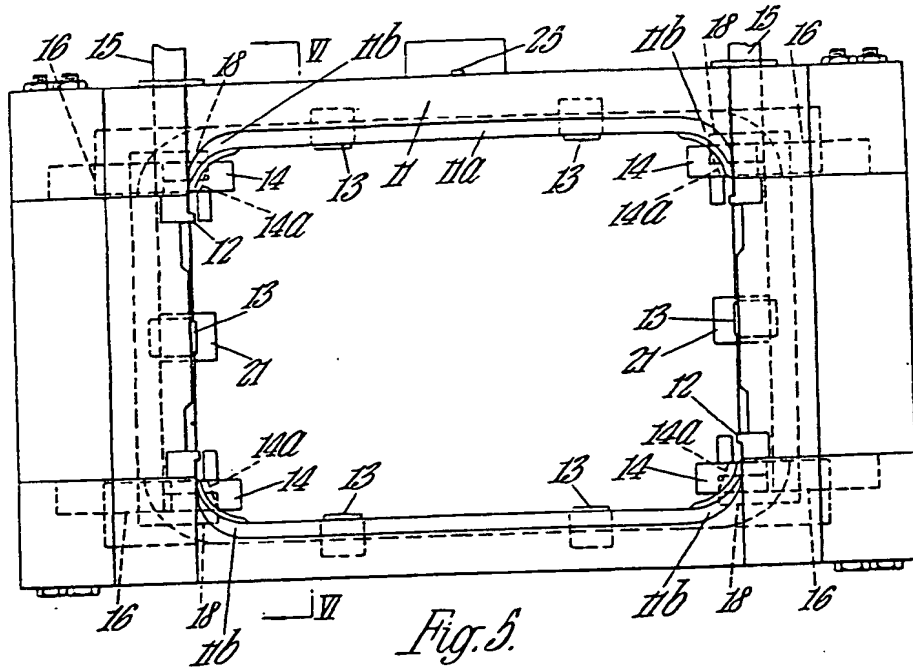
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3 SHEETS

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Sheets 2 & 3



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 Sheet 1

